a thin stiff plane caused to move at sixty miles an hour through it, in a direction inclined to the plane at a slope of about one in eight, was found to be about fifty-three times as great as the estimate given by the old "theoretical" (!) formula, and something like five or ten times that calculated from a formula written on the black-board by Lord Rayleigh, as from a previous communication to the British Association at its Glasgow meeting in 1876.

I had always felt that there was no validity, even for rough or probable estimates, in any of the "theoretical" investigations hitherto published: but how wildly they all fall short of the truth I did not know until I have had opportunity in the last few days, *procul negotiis*, to examine some of the observational results which Maxim gave us in the introduction to his paper. On the other hand, I have never doubted but that the true theory was to be found in what I was taught conversationally by William Froude twenty years ago, and which, though I do not know of its having been anywhere published hitherto, is clearly and tersely expressed in the following sentence which I quote from a type-written copy, kindly given me by Mr. Maxim, of his paper of last week:—

"The advantages arising from driving the aeroplanes on to new air, the inertia of which has not been disturbed, is clearly shown in these experiments."

Founding on this principle, I have at last, I believe, succeeded in calculating, with some approach to accuracy, the force required to keep a long, narrow, rectangular plane moving through the air with a given constant velocity, V, in a direction perpendicular to its length, l, and inclined at any small angle, i, to its breadth, a. In a paper, which I hope to be able to communicate to the *Philosophical Magazine* in time for publication in its next October number, I intend to give the investigation, including consideration of "skin-resistance" and proof that it is of comparatively small importance when i is not much less than 1/10, or 1/20, of a radian, and the "plane" is of some practicably smooth, real, solid material. In the meantime, here is the result, with skin-resistance neglected:—The resultant force (perpendicular, therefore, to the plane) is $2\pi V^2 \sin\theta \cos\theta \, la$; which is $\frac{4\pi \cos\theta}{\sin\theta}$ times (or for the case of $\sin\theta = 8$, one hundred times), the old miscalled "theoretical" result. KELVIN.

Eastern Telegraph Company's Cable Steamer
Electra; crossing the mouth of the Adriatic,
August 17.

Geological Maps of Baden.

IT may interest some of your readers likely to visit the Black Forest, that Herr Winter, of Heidelberg, has begun the issue of an official series of geological maps, each 19½ × 17½ inches, with memoir. Two are already out, one east of Heidelberg, the other giving the Mooswald district, north-east of Gengenbach. The scale is 1 : 25000; *i.e.* 10 cm. to 2½ km., or practically two and a half inches to the mile. Three sections are given on the sheet; the memoir has about 100 pages. The price for the map and memoir is only two marks; if the map is mounted, three marks. I had intended to comment on the contrast between this marvellous cheapness and our own Survey issues, as our inch ordnance cannot approach this for detail; for instance, the contour lines are given for every ten metres. But a paragraph read to-day in the New York *Nation* of August 9, in a letter signed "W. M. D." will speak for me:—". . . unfortunately the publications of the British Surveys are rarely found complete at home outside of the Governmental bureaus in Washington. Very few copies of the British geological reports and maps are presented to libraries in foreign countries, and the prices at which they are sold practically forbids their purchase. The maps are, moreover, coloured by hand, so every copy is expensive; while ours are lithographed, and 'additional copies' are of only nominal cost, perhaps three or four cents apiece. . . . The British practice almost seals up the costly results of the geological surveys. . . . It was a satisfaction to learn that this opinion, formed at home, was shared and emphatically expressed over here" (at Edinburgh).

The Baden State geology maps are also, of course, lithographed, and so are the equally cheap Imperial maps of all Germany, another series, now being published by Justus Perthes, and of which also the first two are just issued and cover the same region, South-west Germany. That the policy pays seems certain. Three other purchases, for instance, were the immediate result of my own, whereas my friends have always been content to *borrow* my English maps, when I could see my way to lend them. J. EDMUND CLARK.

York, August 21.

Variation of "Aurelia."

I SEE that you note (p. 413) the occurrence of an *Aurelia* with pentamerous symmetry. In an expedition of the Liverpool Biological Society to Hilbre Island, a few weeks ago, we found several such specimens, and remarked upon the frequency of the variation. I think the number was either four or five pentamerous forms out of twelve examined.

Port Erin, August 25. W. A. HERDMAN.

CREATURES OF OTHER DAYS.[1]

"CREATURES of Other Days" is a work of literature rather than science, and is yet so full of reference to scientific facts and discoveries that it appears like a work of learning. It narrates the history of extinct animals laboriously discovered, and in many cases still undergoing laborious interpretation by palæontologists, in language which is free from technicality. There is no reference to the anatomical structure of the skeleton which necessitates technical language. There is no critical digest of the facts enumerated, or of the nomenclature under which the fossils are described. No attempt is made to state the osteological characters which distinguish these fossils from each other. Materials which any author has supplied are accepted impartially, and the same animal type is illustrated by dissimilar restorations. Thus Mr. Hulke made a quadrupedal restoration of *Hypsilophodon Foxi*, an animal which once was termed a young *Iguanodon*, out of which Mr. Smit has restored a vigorous-looking lizard. If these interpretations are correct, it is improbable that the vertical bipedal restoration of *Anchisaurus*, given by Prof. Marsh, and restored by Mr. Smit, can also be satisfactory. Many of the original restorations endeavour to convey an idea to the unlearned of the skin and aspect of the living animals. And as these are based upon published figures, or restorations, the author has no doubt gone to the best material which was available, even when the result is unsatisfactory. Sir William Flower, in his preface, fairly states the claim of the restorations to consideration. He says: "In the restoration of the external appearance of extinct animals, known only by bones and teeth, there is much of imagination, much indeed of mere guess-work, and I should therefore be sorry to guarantee the accuracy of any of the representations of animals in this book, the majority of which were never seen in the flesh by the eyes of mortal man. I think, however, I may safely say that Mr. Hutchinson and his accomplished artist, Mr. Smit, have done their work carefully and conscientiously, and given us, in most cases, a fair idea of the appearance of the creatures they have endeavoured to depict according to the best evidence at present available." Sir William commends the figures because they give a better idea of the animals than most persons who only saw their fossil remains would be able to carry away. This unscientific attitude of the book is its chief merit. It is only when the author becomes an expositor of science that scientific men are likely to disagree with him. More care was needed in some of the restorations. The old red sandstone fishes, for example, are drawn without any regard to their relative sizes, those of the upper and lower beds swimming together as though they were of the same geological age, while at the bottom of the water are Trilobites, Brachiopods, and Cephalopods, which no one ever saw in the old red sandstone.

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[1] By Rev. H. N. Hutchinson, B.A., F.G.S., author of "Extinct Monsters." With numerous illustrations by J. Smit and others. (London: Chapman and Hall, Limited, 1894.)

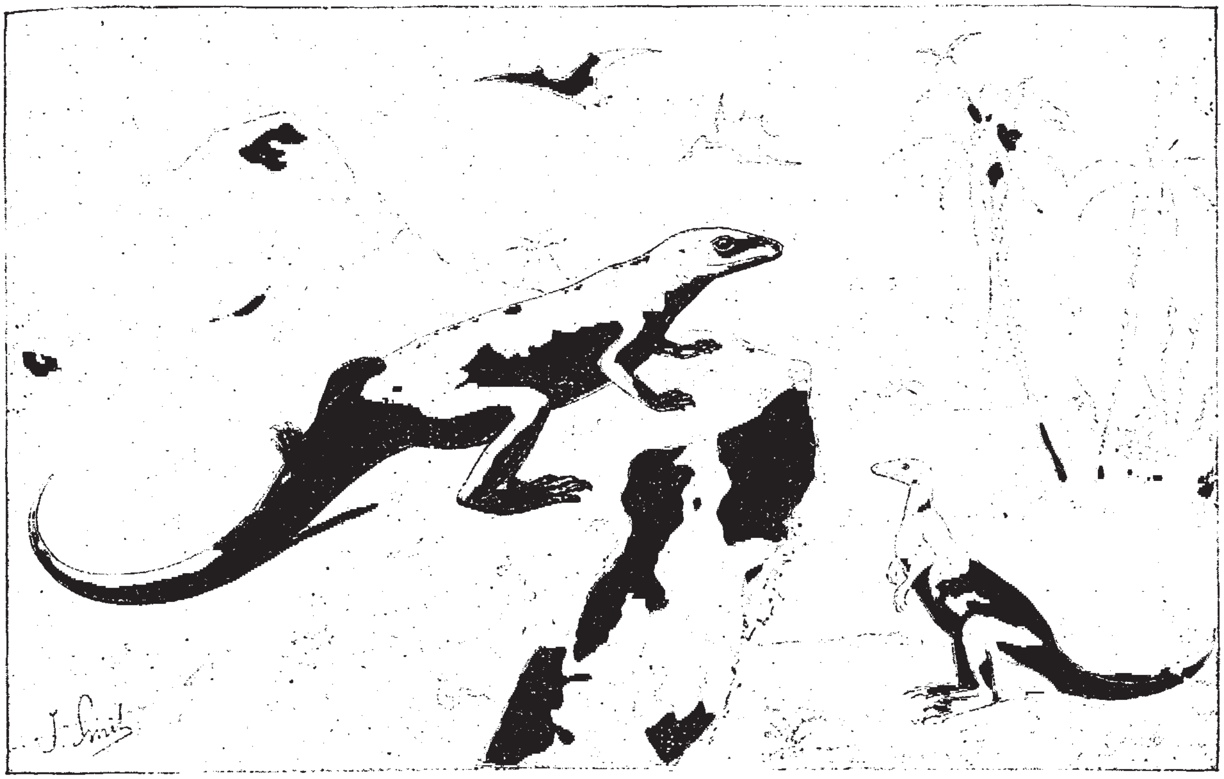
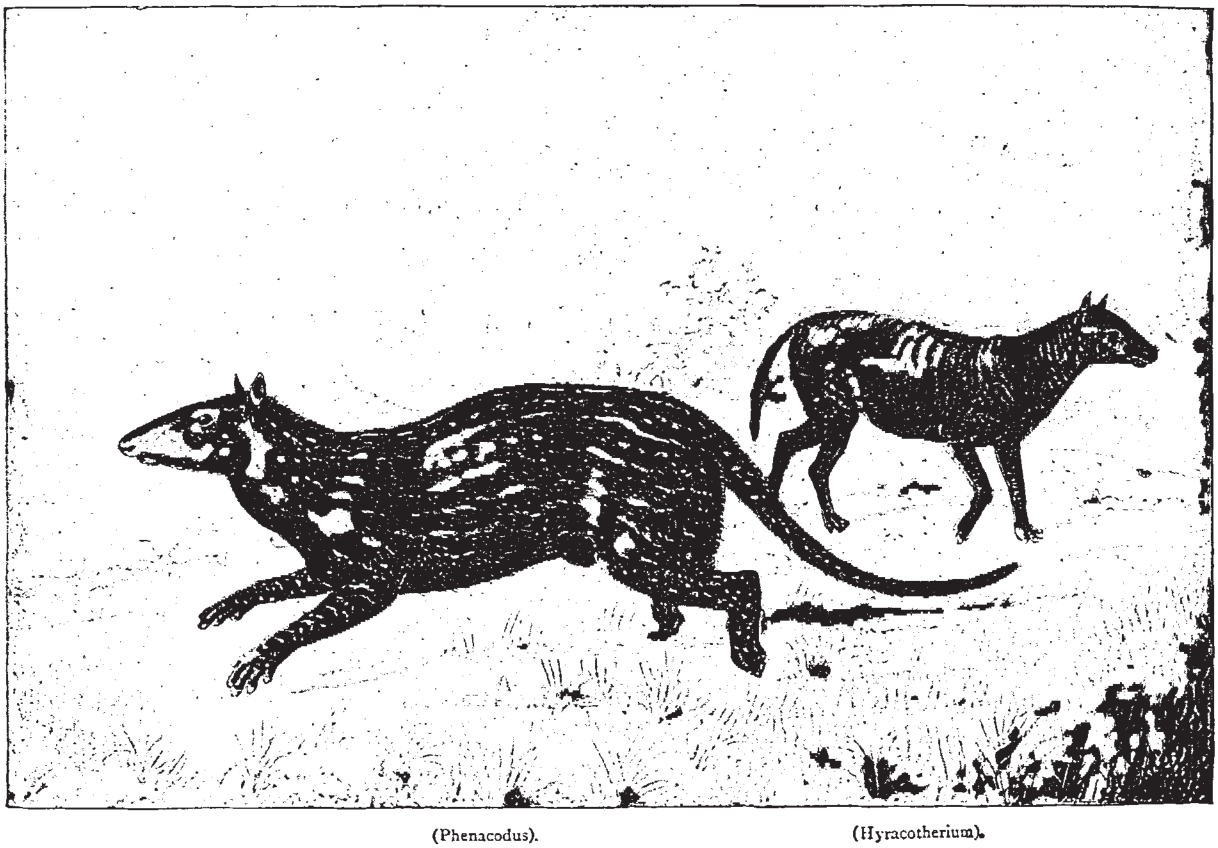


FIG. 1.—A restoration of Hypsilophodon.



(Phenacodus). (Hyracotherium).

FIG. 2.—Ancestors of the Horse. Eocene Period.

Proterosaurus is classed under the Rhynchocephalia, apparently on the author's judgment, though the proposition might be hard to sustain. There are chapters given to Anomodonts, Crocodiles, newly-discovered Dinosaurs, and ancient birds; in which curious illustrations appear, some of the funniest being reproductions of the animals created by Mr. Waterhouse Hawkins for the Central Park, New York. The concluding chapters describe and illustrate mammals. *Palæotherium* and *Coryphodon*, *Dinotherium* and *Mastodon*, are fairly well illustrated. Horses and their ancestors give illustrations of *Phenacodus* and *Hyracotherium*. There is some account of the extinct marsupials of Australia, and of the extinct mammals of South America, such as *Toxodon*, *Macrauchenia*, and *Machærodus*.

The *Bos urus* of Cæsar, which probably became extinct in Britain before the Roman occupation, is represented by a spirited drawing. Appendices give a table of strata, an enumeration of the orders of animals, and a list of books for reference. H. G. S.

ERNEST MALLARD.

THE following paragraphs are extracted from an obituary notice of this distinguished mineralogist, contributed to the *Mineralogical Magazine* by M. G. Wyrouboff:—

In the history of scientific mineralogy the name of M. Mallard will undoubtedly occupy a place beside that of Haüy, to whom is universally conceded the honour of originating this branch of human knowledge. It may be asserted without exaggeration that M. Mallard created anew the science of crystallised bodies by bringing that science into close and intimate union with general physics. Only a few years ago mineralogy was regarded as a purely descriptive science, and crystallography was no more than a special chapter of abstract geometry.

He was a close follower of Bravais, whose beautiful theory he, to his great credit, adopted, developed, and popularised. Bravais, however, viewed the problem of crystalline structure as a geometrician, and saw only one side of the question. His conception of the lattice is based upon the homogeneity of the crystal; now, experience had long ago shown that crystals are far from being always homogeneous. To M. Mallard is due the honour of explaining this apparent contradiction by demonstrating, theoretically and experimentally, that crystals frequently consist of several lattices distributed in a certain regular manner about an axis which does not belong to any one of them.

M. Mallard did more than this, and hereon rests his claim to imperishable fame: he deduced from the theory of lattices and of reticular assemblages all the physical phenomena observed in crystallised bodies, including what were called the optical anomalies. Owing to his labours crystallography became a completely rational science to the same extent as any other branch of physics.

The crowning work of M. Mallard was his "Traité de Cristallographie," which was intended to comprise three volumes. Two only of these have been published; the third was to have dealt with crystalline assemblages, polymorphism and isomorphism, the most complex problems in crystallography, and those in which his most original work was done. The materials from which this volume was to be constructed are to be found in the memoirs published by M. Mallard since 1879. Some of these are real masterpieces, and have become classical; such are the papers on optical anomalies, on the quasi-cubic form of all crystallised bodies, on the transformations of polymorphous substances, and on isomorphous mixtures.

When we add to these the many detailed researches which he published in the *Bulletin* of the French Mineralogical Society, some relating to improved instruments of precision, and some to particular mineral species such as boleite, lussatite, tridymite, and melanophlogite, we cannot but feel that since the time of Haüy no one has done so much to advance that section of physical science which is concerned with crystallised bodies.

NOTES.

M. COTTEAU, whose death we announced last week, has bequeathed his fine collection of living Echinoderms to the Paris Muséum d'Histoire Naturelle.

REUTER reports that an earthquake shock of short duration was felt at Athens at a quarter to eight on the morning of the 26th inst., and also at Corinth, Vastizza, Zante, Thebes, Chalcis, and Atalanti.

IT is announced that a laboratory for the manufacture of tuberculin, mallein, anthrax, vaccine, &c., will shortly be established in Rome in connection with the laboratories of Hygiene of the Ministry of the Interior.

WE learn that Prof. Pettenkofer has resigned the chair of hygiene and the directorship of the Hygienic Institute in the University of Munich, on account of his advanced age. He is succeeded by Prof. Hans Buchner.

THE *British Medical Journal* says that the President of Queen's College, Belfast, has received information that the Government will grant the sum of £2,500 for the erection and equipment of a physiological and pathological laboratory. Plans are being prepared, and the buildings will be at once proceeded with.

MR. H. C. RUSSELL, of Sydney Observatory, writing to us with reference to an aurora observed on July 20, says that he noticed that while the display lasted there was a fog or haze over the southern sky bright enough to hide 5th magnitude stars, and when these began to reappear the auroral light vanished, as if the fog or haze had been necessary for its manifestation.

MR. RICHARD LANGDON, station-master at the Silverton Station of the Great Western Railway, Devon, died on July 18. Nearly thirty years ago he began to study astronomy, in which he took an absorbing interest to the end of his life. Being a skilful mechanician, and having acquired a knowledge of optics, he employed his spare time in constructing an eight-inch silver-on-glass equatorial reflector, grinding the mirror with a machine which he made for the purpose. He was a keen and accurate observer, and in 1872 he read a paper "On certain Markings on the Planet Venus" before the Royal Astronomical Society.

FOR just a year the Birahi Ganga River has been dammed back by the great landslip at Gohna. We noted this event shortly after its occurrence, and on July 5 gave an abstract of Mr. T. H. Holland's report upon it. In this report Mr. Holland estimated that the lake would overflow the barrier about the middle of August. The news has now come that the water reached the top of the dam early on Sunday morning, and cut through the temporary dam which had been constructed to prevent its escaping during the night. Combined percolation and overflow caused the water to fall rapidly, until its length was reduced from five miles to about two and a half miles. Telegraphing on Monday, Reuter's correspondent at Simla says that the water thus released has swept away all the Government buildings on the banks of the river. At Hardwar a torrent of water 6ft. in depth rushed through the town, but there was no